EXata学习(07): LTE 场景 Step by Step

目标: 一步一步建立 LTE 场景

参考: ~\Scalable\exata\5.1\scenarios\Ite\2Cell_1Node\2Cell_1Node_TM3_OLSM

工具: Exata 5.1

1. 创建和配置场景

- a. 创建一个场景,命名为myFirstLTE;
- b. 配置 Channel Properties: 1) 两个2.4GHz信道; 2) Two Ray Pathloss model (默认) 3) Rayleigh fading。

	Array Editor			?	×	
Number of Channels: 2		Properties				
	Index 0 : channel Index 1 : channel General				Help	
		General Properties				
	Property Value					
		Channel Name channel1				
		Channel Frequency 2.4	GHz		-	
		Pathloss Model Two Ray			-	
		[-] Shadowing Model Constant	Constant		-	
		Shadowing Mean (dB) 4.0				
		[-] Fading Model Rayleigh		-	4	
		Maximum Velocity (meters/sec) 10.0				
		Enable Inter-channel Interfernce No			-	
		Signal Propagation Speed (m/s) 3e8				
		Propagation Limit (dBm) -111.0				
		Maximum Propagation Distance 0				
		Propagation Communication Proximity 400				
		Propagation Profile Update Ratio 0.0				
	• • •					
		Apply OK Cano	el A	dd To	Batch	

Properties	
Troperdes	
Value	
2	🔳
Scalable/exata/5.1/scenarios/default/default.fading	🔳
	Value 2 Scalable/exata/5.1/scenarios/default/default.fading

- c. Simulation Time: 300 sec.
- 2. 创建网络拓扑

- a. 选择 2 个Default Device,拟作为eNodeB, 1个 Hub;另一个 Default Device 拟作为MME/S-GW;
- b. 选择合适的 ICON;
- c. 有线连接各节点, 形如下图:



d. 此时RUN,提示错误"PROPAGATION-FADING-GAUSSIAN-COMPONENTS-FILE is missing";检查场景 配置中Channel Properties,在Gaussian Component File中指定默认fading文件:

D:\Scalable\exata\5.1\scenarios\default\default.fading;

? ×							
General Terrain Channel Properties Mobility Cyber Statistics and Tracing Supplemental Files Externa 📕 🕰 Help							
Channel Properties							
Value							
2 1							
F:/ex/myFirstLTE/default.fading 🔳							

e. RUN和PLAY,可以正常,但没有终端和业务,也没有进行LTE协议配置。

f. 创建一个无线子网,加入两个eNodeB,以提供LTE无线接口。



3. 配置网络协议

a. 配置MME/S-GW:

参考例子场景,除了以太接口链路速率和时延微调(100 Mbps改为 10 Mbps, 2.5 us改为 1 ms),其余采用默认配置,结果如下图。

Default Device Properties (Defa	ault Device 3)	? ×		
General Node Configuration	Interfaces	🕰 Help		
- Interface 0 - Physical Layor	MAC Layer			
MAC Layer	Property	Value		
Network Layer Routing Protocol	[-] MAC Protocol	802.3 💌 💶		
- Faults	802.3 Bandwidth	10 Mbps 💌 🔳		
	802.3 Propagation Delay	1 milli-seconds 💌 🜗		
	802.3 Mode	Half-Duplex		
	MAC Propagation Delay	1 micro-seconds		
	Enable Promiscuous Mode	No		
	Enable LLC	No		
	Configure MAC Address	No		
	Use Station VLAN Tagging	No		

b. 配置eNodeB

从eNodeB1开始

i. NodeConfiguration

 Network Layer采用默认; Routing Protocol这里采用静态路由,指定静态配置文件。Static route 的优先级高于路由Default routes。静态路由配置文件通常命名为 "default.routes-static"),保含以下 格式的条目,一条路由规则一行,格式为:

<source nodeId> <destination IP/Subnet Address> <nextHop IP Address>.

• 为配置静态路由方便,首先把各节点IP地址显示出来。View-》Display Setting,勾选 IP Address,此时



• 创建静态路由文件: my_First_LTE.routes-static。暂时设置4 条static routes,分别设置有节点1和2到对 方无线和有线接口的routes,如

1 190.0.2.2 190.0.1.2 1 190.0.1.2 190.0.1.2 2 190.0.2.1 190.0.1.1 2 190.0.1.1 190.0.1.1 5 # 5100N-1

• 在节点1的Node Configuration的 Routing Protocol中指定上述静态路由文件,

Default Device Properties (Defau	It Device 1)	?				
General Node Configuration	Interfaces	🖽 He				
Mobility and Placement	Routing Protocol					
Schedulers and Queues	Property	Value				
 QoS Configuration Cyber 	Routing Protocol IPv4	None 💌 🔳				
ARP	Enable IP Forwarding	Yes				
DNS	[-] Specify Static Routes	Yes 💌 🔳				
Fixed Communications Routing Protocol	Static Route File	/myFirstLTE/my_First_LTE.routes-static 🔳				
Router Properties	Specify Default Routes	No				
MPLS	Enable Multicast	No				
Application Layer Network Management	Configure Default Gateway	No				
User Behavior Model	Enable HSRP Protocol	No				
OS Resource Model External Interface Properties Faults File Statistics Statistics Database Dacket Tacing						

• 配置有线 Interfaces (这里为Interface 0): 改为802.3 Bandwidth: 10 Mbps, 802.3 Propagation delay:

1 ms。如下

Default Device Properties (Default Device 1)

Seneral Node Configuration Interfaces

Interface 0 Development	MAC Layer				
MAC Layer	Property	Value			
Network Layer Houting Protocol	[-] MAC Protocol	802.3 💌 🔳			
- Faults	802.3 Bandwidth	10 Mbps 💌 🔳			
Interface 1	802.3 Propagation Delay	1 mili-seconds 🔽 🔳			
	802.3 Mode	Half-Duplex 💌			
	MAC Propagation Delay	1 micro-seconds 💌			
	Enable Promiscuous Mode	No			
	Enable LLC	No			
	Configure MAC Address	No			
	Use Station VLAN Tagging	No			

ii. 配置 LTE 接口:

Physical Layer: Listenable和Listening Channels勾选两个channels; Radio Type: LTE Phy; Station Type: evolved Node B; 修改天线为2收2发!

Default Device Properties (Default Device 1)				
General Node Configuration	Interfaces		🕮 Help	
⊡ Interface 0	Physic	•		
Physical Layer	Property	Value		
MAC Layer	Listenable Channels	channel0		
Routing Protocol Faults	Listening Channels	channel0		
File Statistics	[-] Radio Type	LTE PHY	• •	
	[-] Station Type	evolved Node B	• •	
	DL Channel Index	0		
	UL Channel Index	1		
	Transmission Power (dBm)	23		
	Number of Transmission Antennas	2	•	
	Number of Reception Antennas	2	▼ ∢	
	Control Signals Overhead for Uplink	0		
	[-] Packet Reception Model	BER-based Reception Model	•	
	BER Table[0]	DL_BER_MCS0.ber		
	BER Table[1]	DL_BER_MCS1.ber		
	BER Table[2]	DL_BER_MCS2.ber		
	BER Table[3]	DL_BER_MCS3.ber		
	BER Table[4]	DL_BER_MCS4.ber		
	BER Table[5]	DL_BER_MCS5.ber		
	BER Table[6]	DL_BER_MCS6.ber		
	BER Table[7]	DL_BER_MCS7.ber		
	BER Table[8]	DL_BER_MCS8.ber		
	BER Table[9]	DL_BER_MCS9.ber		
		Fact and the second sec		
🔌 Find	A	pply OK Cancel	Add To Batch	

 此时,运行会提示出错,找不到*.ber文件,如"Can't open input file UL_BER_MCS24.ber",到例 子场景中拷贝上下行的*.ber,即可。【问题:能否在选择文件时使用相对路径?包括前面的fading和 静态路由文件,能否让程序直接寻找场景文件根目录?例子程序直接选用文件名即可,即使搬到其

🚇 Help

他路径下也没有问题,而我们的例子不行。一定有哪个地方有设置。由于涉及MCS BER文件数量巨 多,配置非常麻烦!待解决。答: File-》 save as portable即可解决,保存为Portable类型的场景,将 把所有依赖的文件保存在config场景文件夹下,随地可运行。】

• MAC Layer: MAC Protocol: LTE MAC; Station Type: evolved Node B; MAC Transmission Mode: Transmission Diversity Open Loop Spatial Multiplexing.

ieneral Node Configuration	Interfaces		H		
⊡ Interface 0	MAC Layer				
Physical Layer	Property	Value			
MAC Layer	[-] MAC Protocol	LTE MAC	· •		
Routing Protocol	[-] Station Type	evolved Node B	· 🔳		
File Statistics	RRC : Measurement Filtering Coeffi	. 40			
	RLC : Max Retransmission Threshold	8			
	RLC : Threshold Number of PDUs f	. 16			
	RLC : Threshold Number of Bytes	250			
	RLC : t-PolRetransmit Timer Period	100 milli-seconds	•		
	RLC : t-Reordering Timer Period	100 milli-seconds	•		
	RLC : t-StatusProhibit Timer Period	12 milli-seconds	-		
	MAC : Backoff Period	10 milli-seconds	-		
	MAC : Initial Received Target Pow	-90			
	MAC : Power Ramping Step (dB)	2			
	MAC : Maximum Number of Pream	4			
	MAC : RA Response Window Size	10			
	MAC : PRACH Configuration Index	14	_		
	MAC : Periodic BSR Timer (TTI)	1			
	MAC : eNB Scheduler Type	Round Robin	•		
	MAC : Transmission Mode	Transmission Diversity / Open Loop Spat 💌	• •		
	MAC : Target BLER	0.01			
	MAC : PF Filter Coefficient	36	_		
	MAC : PF Scheduler UL RB Allocati	1	_		
	MAC Propagation Delay	1 micro-seconds	; •		
	Enable Promiscuous Mode	No	•		
	Enable LLC	No	-		
	Configure MAC Address	No			

类似的方法配置eNodeB2。至此,网络部分可以正常运行



4. 添加和配置终端

- a. 添加终端:添加两个default device,作为UE,选择合适的ICON, Save as Portable...,替换原config文件, ICON 文件将自动拷贝到文件夹下。
- b. 添加到无线子网中:将两个UE添加到eNB所在的无线子网中。
- c. 参考eNodeb无线接口的参数进行两个UE Interface的配置,除了Station Type为User Equipment,天线为1发2收。 【奇怪的问题:参考例子中两个UE的Interface中,Physical Layer的Station Type为 eNB,而MAC层为UE。不知 何故?】

Default Device Properties (Default Device 4)

General Node Configuration	Interfaces	🚇 Help
- Interface 0 - Dyvical Layor	Physic	cal Layer 🔺
MAC Layer	Property	Value
	Listenable Channels	channel0,channel1
Faults	Listening Channels	channel0,channel1
	[-] Radio Type	LTE PHY 🗾 🔳
	[-] Station Type	User Equipment
	Transmission Power (dBm)	23
	Number of Transmission Antennas	1
	Number of Reception Antennas	2 🗸
	[-] Packet Reception Model	BER-based Reception Model
	BER Table[0]	F:/ex/myFirstLTE/DL_BER_MCS0.ber 1
	BER Table[1]	DL_BER_MCS1.ber

d. 至此, RUN没有问题, PLAY时出错, 错误提示"EPC subnet should be specified to send EPC app", 这是 因为没有配置EPC核心网所致。

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e. 指定EPC核心网: Table View-》Networks,选择Wired Subnet,在 Is EPC Subnet选择Yes,指定EPCSGWMME Node为节点 3.如图:



f. 在4和5之间添加 CBR业务, 设定参数如下

CBR Properties

Source Destination Items to Se

Item Size (b

Precedence Value

Enable RSVP-TE

Enable MDP

Session Name

Interval Start Time End Time

[-] Priority

myLTE Nov 16 Application - CBR Client

 \times ?

• •

•

•

seconds

General

		Help
General	Properties	_
Property	Value	
	4	•
	5	•
nd	0	4
ytes)	512	_
	1 seconds	•
	1 seconds	•

Precedence

[Optional]

0

0

No

No

g. Run & Play,	Ģ	只有节点4发	支出 300 个消息,	没有发现]节点 5 收到;	
uu						
Nov_16_22_16_48_54.stat		[CBR Client : Total Un	nicast Messages Sent (messages)] Co	mpare By : Node ID		
ation R Client	-					
Unicast Session Finish (seconds)					CBR Client : To	tal Unicast Messages Sent
First Unicast Fragment Sent (sec Last Unicast Fragment Sent (sec		340.				
 Total Unicast Fragments Sent (fr 		220				



h. 查看IP层丢包,发现 299 是由于 No route 被丢弃。推测可能是由于静态路由配置有误所致。



i. 解决静态路由配置问题: 想起来添加节点 4 和 5 之后, 未添加新的路由规则。

j. 查看 Error Log窗口,在Run时还是有不少 Warning,着手解决这些Warning。考虑通过对比config文件。

Warning in file ...\libraries\lte\src\phy_lte.cpp:2240 Phy-LTE: CQI reporting interval should be set.Change CQI reporting interval to 10.

Warning in file ...\libraries\lte\src\phy_lte.cpp:2311 Phy-LTE: CQI reporting offset should be set.Change CQI reporting offset to 0.

Warning in file ..\libraries\lte\src\phy_lte.cpp:2381 Phy-LTE: Ri reporting interval should be set.Change Ri reporting interval to 10.

Warning in file ...\libraries\lte\src\phy_lte.cpp:2453 Phy-LTE: Ri reporting offset should be set.Change Ri reporting offset to 1.

Warning in file ...\libraries\lte\src\phy_lte.cpp:2544 Phy-LTE: Non Serving cell Measurement Period should be set.Change Non Serving cell Measurement Period to 200000000.

Warning in file ..\libraries\lte\src\phy_lte.cpp:2613 Phy-LTE: CELL Selection min serving duration should be set.Change CELL Selection min serving duration to 1000000000.

Warning in file ...\libraries\lte\src\phy_lte.cpp:3075 Phy-LTE: SRS transmission interval should be set.Change SRS transmission interval to 10.

Warning in file ...\libraries\lte\src\phy_lte.cpp:3148 Phy-LTE: SRS transmission offset should be set.Change SRS transmission offset to 0.

k.

5. 结束语

<mark>始终无法实现UE之间流量的收发,也始终没找到原因。</mark>决定重新完全按照例子的拓扑进行重建。